

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/976,316
Attorney Docket No. Q66357

REMARKS

I. Introduction

Claims 1-15 are all the claims pending in the application, and claims 1-15 have been examined. Claims 1-15 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Zavracky, U.S. Patent No. 5,638,946 (hereinafter "Zavracky"), in view of Rodgers et al., U.S. Patent No. 6,133,670 (hereinafter "Rodgers"). Additionally, claim 1 stands rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Applicants overcome the rejections of claims 1-15 as follows.

II. Claim Rejections -- 35 U.S.C. § 112, Second Paragraph

Claim 1 stands rejected under § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner alleges that "it is not clear what is meant by 'stacking an anti-stiction layer that is operative to be removed by dry etching one of before and after stacking the sacrificial layer' since the claim does not define where to stack/putting on the layers or whether the stacking is performed on a substrate or on another layer".

Applicants amend claim 1 to further clarify that "one of said sacrificial layer and said anti-stiction layer is formed on said substrate". Applicants respectfully submit that these amendments to claim 1 overcome the Examiner's rejection of claim 1 under 35 U.S.C. § 112, second paragraph.

Applicants also amend claim 1 to further clarify that an anti-stiction layer is stacked "at least one of before and after stacking the sacrificial layer" (*see* Applicants' Specification at page 3, lines 3-6).

III. Claim Rejections -- 35 U.S.C. § 103(a)

Claims 1-15 stand rejected under § 103(a) as allegedly being unpatentable over Zavracky, in view of Rodgers.

A. Claims 1, 5, 9, and 15

The Examiner's position is that the polysilicon layer 80 of Zavracky (Zavracky: col. 9, lines 47-60; col. 10, lines 7-28; Fig. 7D) teaches the anti-stiction layer of claim 1 (*see also* claims 5, 9, and 15). Although the Examiner acknowledges that this polysilicon layer 80 of Zavracky is removed by wet etching, contrary to the anti-stiction layer of claim 1 (*see also* claims 5, 9, and 15), the Examiner alleges that Rodgers teaches that polysilicon can be etched away with either wet etching or dry etching (Rodgers: col. 11, lines 1-5). The Examiner goes on to conclude that one skilled in the art would have found it obvious to modify Zavracky to use dry etching to remove the polysilicon layer, as taught by Rodgers.

Applicants respectfully submit that the polysilicon layer 80 relied on by the Examiner is not an anti-stiction layer. The polysilicon layer 80 of Zavracky is a first sacrificial layer (Zavracky: col. 9, lines 47-49). The function of this first sacrificial layer is to set the appropriate, desired contact protrusion dimension (Zavracky: col. 9, lines 52-54), which is fundamentally different than the function of the claimed anti-stiction layer.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/976,316
Attorney Docket No. Q66357

Applicants amend claims 1, 5, 9, and 15 to further clarify that the anti-stiction layer "is operative to be removed by dry etching **for preventing stiction**" (*see also* claims 5, 9, and 15). Thus, the function of the anti-stiction layer, as recited in method claims 1, 5, 9, and 15, distinguishes these claimed embodiments over a reasonable combination, if any, of Zavracky and Rodgers.

Furthermore, Applicants respectfully submit that the Examiner has failed to provide any reasonable suggestion or motivation for combining the teachings of Zavracky and Rodgers.

The Examiner's position is that because Rodgers teaches that both wet and dry etching can be used to remove polysilicon (Rodgers: col. 10, line 65 to col. 11, line 5), the two processes are equally interchangeable. However, Applicants' Specification clearly notes differences between the use of wet etching and the use of dry etching techniques.

For example, the use of wet etching (and subsequent cleaning with a cleaning solution) can result in stiction due to the surface tension of any remaining cleaning solution (Applicants' Specification at page 2, lines 3-13). Thus, Zavracky's use of wet etching is additional evidence that Zavracky is not concerned with stiction when removing sacrificial layers to form a micromechanical device.

While Rodgers generally mentions that both wet etching and dry etching can be used to remove a polysilicon layer, like Zavracky, Rodgers fails to teach or suggest any use of an anti-stiction layer. Indeed, to the contrary, Rodgers describes structural modifications intended to reduce the bowing of its electrostatic combs, which can lead to stiction (*see, e.g.*, Rodgers: col. 7, lines 20-62).

Furthermore, the use of dry etching may damage the material of a suspended microstructure such as polycrystalline silicon (Applicants' Specification at page 2, lines 24-27). Even further, the use of dry etching can be more cost prohibitive than the use of wet etching (Applicants' Specification at page 4, lines 13-17). Given these considerations, dry etching is not equally interchangeable with wet etching, and the Examiner's conclusory statement that "substitution of one for another would have produced an expected result" is contradicted. Thus, the Examiner has failed to establish, absent impermissible hindsight, why it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the teachings of Zavracky and Rodgers.

Indeed, even assuming *arguendo*, that a valid suggestion or motivation exists for combining Zavracky and Rodgers, the Examiner has still failed to explain how the combination of Zavracky and Rodgers teaches or suggests "removing the sacrificial layer by wet etching while removing the anti-stiction layer by dry etching" (*see, e.g.*, claim 15).

For at least the above exemplary reasons, claims 1, 5, 9, and 15, as amended, are patentable over Zavracky and Rodgers.

B. Claims 2-4, 6-8, and 10-14

Consequently, claims 2-4, 6-8, and 10-14 are patentable over Zavracky and Rodgers at least by virtue of their dependency.

IV. Priority

Applicants thank the Examiner for acknowledging Applicants' claim for foreign priority under 35 U.S.C. § 119, including receipt of the priority document.

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/976,316
Attorney Docket No. Q66357

V. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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PATENT TRADEMARK OFFICE

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APPENDIX
VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

The claims are amended as follows:

1. (Amended) A method of fabricating a micromachined structure suspended above a substrate using a sacrificial layer, the method comprising the step of stacking an anti-stiction layer that is operative to be removed by dry etching for preventing stiction at least one of before and after stacking the sacrificial layer, and

wherein one of said sacrificial layer and said anti-stiction layer is formed on said substrate.

5. (Amended) A method of fabricating microstructures, the method comprising:
preparing a substrate;
forming an anti-stiction layer that is removed by dry etching for preventing stiction on the substrate;

forming a sacrificial layer that is removed by wet etching on the substrate;
removing parts of the anti-stiction layer and the sacrificial layer so that a part of the substrate is exposed and forming a resulting structure including a post; and
forming at least one structure layer for forming at least one microstructure over the resulting structure.

9. (Amended) A method for fabricating microstructures, the method comprising:

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No. 09/976,316
Attorney Docket No. Q66357

preparing a substrate;
forming an anti-stiction layer on the substrate;
forming a sacrificial layer on the anti-stiction layer;
forming at least one structure layer for creating at least one microstructure on the sacrificial layer; and
removing the sacrificial layer by a first etching and removing the anti-stiction layer by a second etching in order to release the at least one microstructure while preventing stiction.

15. (Amended) A method of fabricating microstructures, the method comprising:

preparing a substrate;
forming a sacrificial layer on the substrate;
forming an anti-stiction layer on the sacrificial layer; and
forming at least one structure layer for forming at least one microstructure on the anti-stiction layer and removing the sacrificial layer by wet etching while removing the anti-stiction layer by dry etching in order to release the at least one microstructure while preventing stiction.